CLAIMS

Sub A2

1. A method of making a diode laser assembly, comprising:

providing a substrate;

forming an epitaxial structure on the substrate, the epitaxial structure having optically active and optically inactive areas;

forming a waveguide layer in the epitaxial structure; and

forming a laser and an amplifier in the epitaxial structure containing the waveguide layer.

2. The method of claim 1, wherein the optically active areas of the epitaxial structure are formed using off-set quantum wells.

3. The method of claim 1, wherein the optically inactive areas are formed by a selective area growth.

4. The method of claim 1, wherein the optically inactive areas are formed by a selective area growth using a dielectric mask.

5. The method of claim 1, wherein the optically inactive areas are formed by selective area disordering.

6. The method of claim 1, wherein the optically inactive areas are formed by butt joint regrowth.

7. The method of claim 1, wherein the optically inactive areas are formed with multiple quantum well layers grow on top of the waveguide layer.

8. The method of claim 1, further comprising:

forming areas of different bandgaps in the epitaxial structure.

9. The method of claim 1, further comprising:

bombarding at least a portion of the epitaxial structure with ions; and

tailoring a bandgap the at least a portion of the epitaxial structure to create a gain medium of the laser.

10. The method of claim 9, further comprising:
annealing at least a portion of the epitaxial structure to diffuse impurities and vacancies in a selected region of the epitaxial structure to determine the region's optical properties.

11. The method of claim 4, wherein the ions have an energy no greater than about 200 eV.

12. The method of claim 1, wherein the amplifier includes a first active region and a passive region.

13. The method of claim 12, wherein the waveguide extends through at least a portion of the amplifier.

14. The method of claim 13, wherein the waveguide extends through the first active region and the passive region.

15. The method of claim 14, wherein a distal portion of the waveguide in the amplifier is curved.

16. The method of claim 14, wherein a distal portion of the waveguide in the amplifier is curved and the amplifier includes a tapered section.

17. The method of claim 14, wherein a distal end of the waveguide in the amplifier terminates at an oblique angle to an output facet.

18. The method of claim 1, wherein at least a portion of the waveguide is tapered.

19. The method of claim 1, wherein the waveguide includes an active section.

20. The method of claim 19, wherein the active section of the waveguide is positioned in the first active section of the amplifier.

21. The method of claim 19, wherein the active section of the waveguide is positioned in the second active section of the amplifier.

22. The method of claim 12, wherein the first active region has a tapered distal face.

23. The method of claim 12, wherein the amplifier includes a second active region.

24. The method of claim 23, wherein the first and second active regions are separated by a passive region.

25. The method of claim 24, wherein the first active region has a tapered distal face.

26. The method of claim 25, wherein the second active region has a tapered proximal face.

27. The method of claim 26, wherein the tapered distal face of the first active region is parallel to the tapered proximal face of the second active region.

28. The method of claim 26, wherein the second active region has a tapered distal face.

29. The method of claim 28, wherein the proximal face and the distal face of the second region are parallel.

30. The method of claim 1, wherein the laser includes first and second reflectors, at least one of the first and second reflectors being a distributed Bragg reflector.

31. The method of claim 30, wherein a maximum reflectivity of at least one of the first and second reflectors is tunable.

32. The method of claim 31, wherein the maximum reflectivities of each of the first and second reflectors are tunable relative to each other.

33. A method of making a diode assembly, comprising:

providing a substrate;

forming a first semiconductor layer and a second semiconductor layer in an epitaxial structure having optically active and optically in-active areas, the first and second semiconductor layers having different dopings; and

forming a first waveguide layer between the first and second semiconductor layers, the first waveguide layer including an amplifier, a first reflector, a second reflector and a gain medium, the first and second reflectors defining a laser cavity.

34. The method of claim 33, wherein the optically active areas in the epitaxial structure are formed using off-set quantum wells.

35. The method of claim 33, wherein the optically inactive areas in the epitaxial structure are formed by a selective area growth.

36 The method of claim 33, wherein the optically inactive areas are formed by a selective area growth using a dielectric mask.

37. The method of claim 33, wherein the optically inactive areas are formed by selective area disordering.

38. The method of claim 33, wherein the optically inactive areas are formed by butt joint regrowth.

39. The method of claim 33, wherein the optically inactive areas are formed with multiple quantum well layers grow on top of the waveguide layer.

40. The method of claim 33, further comprising:

forming areas of different bandgaps in the epitaxial structure.

41. The method of claim 33, further comprising:

bombarding at least a portion of the epitaxial structure with ions; and

tailoring a bandgap the at least a portion of the epitaxial structure to create a gain medium of the laser.

42. The method of claim 41, further comprising: annealing at least a portion of the epitaxial structure to diffuse impurities and vacancies in a selected region of the epitaxial structure to determine the region's optical properties.

43. The method of claim 36, wherein the ions have an energy no greater than about 200 eV.

44. The method of claim 33, wherein the amplifier includes a first active region and a passive region.

45. The method of claim 44, wherein the waveguide layer includes a waveguide that extends through at least a portion of the amplifier.

46. The method of claim 45, wherein the waveguide extends through the first active region and the passive region.

47. The method of claim 46, wherein a distal portion of the waveguide in the amplifier is curved.

48. The method of claim 46, wherein a distal portion of the waveguide in the amplifier is curved and the amplifier includes a tapered section.

49. The method of claim 46, wherein a distal end of the waveguide in the amplifier terminates at an oblique angle to an output facet.

50. The method of claim 45, wherein at least a portion of the waveguide is tapered.

51. The method of claim 45, wherein the waveguide includes an active section.

52. The method of claim 51, wherein the active section of the waveguide is positioned in the first active section of the amplifier.

53. The method of claim 51, wherein the active section of the waveguide is positioned in the second active section of the amplifier.

54. The method of claim 44, wherein the first active region has a tapered distal face.

55. The method of claim 44, wherein the amplifier includes a second active region.

56. The method of claim 55, wherein the first and second active regions are separated by a passive region.

57. The method of claim 56, wherein the first active region has a tapered distal face.

58. The method of claim 57, wherein the second active region has a tapered proximal face.

59. The method of claim 58, wherein the tapered distal face of the first active region is parallel to the tapered proximal face of the second active region.

60. The method of claim 58, wherein the second active region has a tapered distal face.

61. The method of claim 60, wherein the proximal face and the distal face of the second region are parallel.

62. The method of claim 33, wherein at least one of the first and second reflectors is a distributed Bragg reflector.

63. The method of claim 62, wherein a maximum reflectivity of at least one of the first and second reflectors is tunable.

64. The method of claim 63, wherein the maximum reflectivities of each of the first and second reflectors are tunable relative to each other.

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